

Serial No. 09/629,321

Attorney Docket No. PF01869NA

Reply to Office Action of September 8, 2004

**BEST AVAILABLE COPY****IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No.:09/629,321

Confirmation No.: 4702

**RECEIVED  
CENTRAL FAX CENTER**

Applicant(s): Hill, Thomas C., et al.

Examiner: Moore, James K.

**OCT 12 2004**

Filed: July 31, 2000

Docket No.: PF01869NA

TC/A.U.: 2686

Customer No.: 20280

Title: Method and Apparatus to Improve Capacity and Battery Life of an Ad  
Hoc Network System Using Sensor Management

---

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION UNDER 37 C.F.R. § 1.131**

Sir:

The following Declaration and any attachments are to establish conception in the United States of claimed subject matter in the referenced patent application and diligence to the filing of the referenced patent application on July 31, 2000, from a date prior to the effective date of the following references relied upon by the Examiner to support rejections under 35 U.S.C. 102(e) in the Office Action dated September 8, 2004:

U.S. Patent Publication No. US2001/0031633A1 (Tuomela, et al) filed in the United States on November 30, 2000, having an earliest priority date of December 1, 1999.

U.S. Patent Publication No. US2003/0060212A1 (Thomas) filed in the United States on February 28, 2001, having an earliest priority date of February 28, 2000.

Serial No. 09/629,321  
Reply to Office Action of September 8, 2004

Attorney Docket No. PF01869NA

In support of this declaration, we, Thomas C. Hill of Crystal Lake, Illinois, and Slim Souissi of San Diego, California, declare and sayeth the following:

That we conceived the claimed subject matter of the referenced patent application in the United States before August 24, 1999, which is prior to the effective date of United States Patent Publication No. US2001/0031633A1 (Tuomela, et al) and U.S. Patent Publication No. US2003/0060212A1 (Thomas), in the course of employment by Motorola Inc., the assignee of the instant application by virtue of an assignment duly recorded on the Official record of the United States Patent & Trademark Office, REEL/FRAME 011201/0122;

That the claimed subject matter of the referenced patent application was the subject of a written invention disclosure prepared and executed after conception on August 24, 1999, and that the invention disclosure was subsequently submitted to a Patent Committee of Motorola Inc., the assignee of record for consideration and assignment to a patent attorney for preparation and filing of a patent application;

That each of the dates redacted from the disclosure attached as Appendix I is prior to the effective dates of United States Patent Publication No. US2001/0031633A1 (Tuomela, et al) and U.S. Patent Publication No. US2003/0060212A1 (Thomas);

That on information and belief a patent application was prepared and filed, in due course upon, in the United States Patent Office on July 31, 2000, by or on behalf of Motorola Inc.;

That all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Serial No. 09/629,321

Attorney Docket No. PF01869NA

Reply to Office Action of September 8, 2004

  
THOMAS C. HILL

DATE

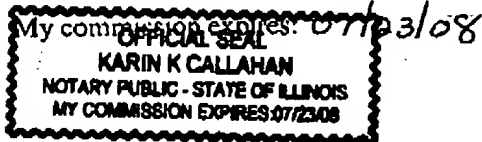
Oct 6, 2004

STATE OF Illinois )

ss:

COUNTY OF DuPage )

The undersigned Notary Public in and for the County and State aforesaid, do hereby certify that Thomas C. Hill whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that they signed, sealed and delivered the instrument as their free and voluntary act and deed for the uses and purposes therein set forth.

Given under my hand and notarial seal this 6 day of October, 2004.  
Notary Public Signature  
Printed Name of Notary Public  
SLIM SOUSSI

DATE

October 5<sup>th</sup> 2004

STATE OF California - )

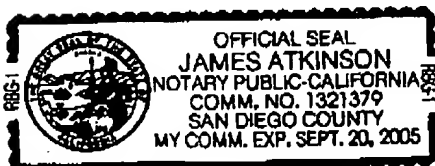
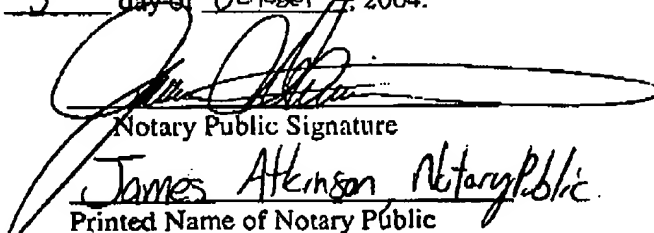
ss:

COUNTY OF San Diego )

The undersigned Notary Public in and for the County and State aforesaid, do hereby certify that Slim Souissi whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that they signed, sealed and delivered the instrument as their free and voluntary act and deed for the uses and purposes therein set forth.

Given under my hand and notarial seal this 5 day of October, 2004.

My commission expires: 9/20/2005

  
Notary Public Signature  
Printed Name of Notary Public

Page 3 of 3

APPENDIX *Advanced Invent*

Page 1 of 2

**MOTOROLA**
 Security Classification  
 Motorola Confidential Proprietary  
 (When Completed)

 # OF COPIES NEEDED  
 AFTER A # IS ASSIGNED


Advanced Inventing

**PATENT DISCLOSURE**

REV. 05/31/95 SUBMITTED PURSUANT TO EMPLOYEE AGREEMENT

INTELLECTUAL PROPERTY DEPT. USE ONLY
DISCLOSURE NO. <i>PEX890A</i>
DATE <i>8/9/99</i>
PATENT COMMITTEE ACTION
INVENTOR(S)

**THIS SECTION TO BE COMPLETED BY INVENTOR(S)**

- Name of invention: (Limit to ten words.)  
**Method to Improve Capacity and Battery Life of an Ad Hoc Short Range System using Sensor Mgmt.**
- Documentation Date: (Attach log sheets, drawings, etc., to support the earliest date you documented your idea.)  
*8/9/99*
- Whom did you first tell about your invention? *NarSteve Goldberg* Date: *8/9/99*
- Is this disclosure being submitted as a Design disclosure? Yes ☐ No ☒  
*If Yes, please attach a completed PPG DESIGN DISCLOSURE FORM along with this disclosure.*
- What problem is solved by this invention? (Attach additional sheets if necessary.)  
*(see attached)*
- What is the closest known technology? (Attach additional sheets if necessary.)  
*none known*
- What is this invention? (AN ABSTRACT IS REQUIRED BELOW) Use additional sheets if necessary to describe how it resolves the problems in a new or novel way not accomplished by the closest known technology. NOTE: If your invention doesn't accomplish something new, or in a novel way, then it is likely NOT patentable.  
*This invention uses sensors, sensor processing, sensor management (ad hoc and centralized), and sensor sharing to improve the battery life and capacity of a short range system while retaining the ad hoc nature and advantages of the system.*

**THIS SECTION TO BE COMPLETED BY AN ENGINEERING OR PRODUCT MANAGER (or higher) ONLY**

- Product to be used in/on: (If a process, name the first product the process was/is to be used on.)  
*PAN*
  - Has/Is/Will this product been/being/be offered for sale? Have products incorporating this invention been described, quoted, or demonstrated to a customer? Have orders been accepted for the product? Explain the circumstances.)  
*Not Yet*
  - If item 2 is yes, when was/will the first offer for sale of a product incorporating this invention (be) made?  
Date: \_\_\_\_\_
  - When is the estimated ship date? *NA*
  - When was/will the first disclosure outside of Motorola (be) made?
  - How will the disclosure be made (state title and date of publication, if any) and to whom?
  - Was a non-disclosure agreement signed? Yes ☐ Date: \_\_\_\_\_ No ☐
  - Engineering or Product Manager's Name (Type): *Casey Hill* Phone: *2770*  
*I attest to the accuracy of the above information*
- Signature of Engineering or Product Manager (or higher): *Casey Hill* Date: *8/24/99*

**PAGING PRODUCTS GROUP****PATENT DISLCOSURE**

(PRIMARY)

INVENTOR:	HILL	THOMAS	CASEY	252-31-2357	Ray Bartik
(LEGAL NAMES)LAST (SURNAME)	FIRST	MIDDLE	SOCIAL SECURITY	IMMEDIATE SUPVR.	
HOME ADDRESS	35 TROON COURT	TROPHY CLUB	TEXAS	76262	CASE12
STREET	CITY		STATE	ZIP	EMAIL ID
US	EW524	52770	PIN6344983	TX72	S258 1 P
CITIZENSHIP	DEPT. NO.	OFFICE	PAGER	LOC	MAIL SHIFT STATUS
(U.S., Etc)	PHONE	CODE	STOP	P/C	

INVENTOR:	SOUISSI	SLIM	C. HILL
(LEGAL NAMES)LAST (SURNAME)	FIRST	MIDDLE	SOCIAL SECURITY IMMEDIATE SUPVR.
HOME ADDRESS	5701 SANDSHELL DR, #2008	FT. WORTH	TX 76137
STREET	CITY	STATE	ZIP EMAIL ID
TUNISIA	EW524	2837	S258 PERM
CITIZENSHIP	DEPT. NO.	OFFICE	PAGER LOC MAIL SHIFT STATUS
(U.S., Etc)	PHONE	CODE	STOP P/C

INVENTOR:				
(LEGAL NAMES)LAST (SURNAME)	FIRST	MIDDLE	SOCIAL SECURITY	IMMEDIATE SUPVR.
HOME ADDRESS				
STREET	CITY	STATE	ZIP	EMAIL ID
CITIZENSHIP	DEPT. NO.	OFFICE	PAGER LOC MAIL SHIFT STATUS	
(U.S., Etc)	PHONE	CODE	STOP P/C	

**INVENTOR'S SIGNATURES:**

INVENTOR'S FULL SIGNATURE	DATE
<i>[Signature]</i>	8/24/99
INVENTOR'S FULL SIGNATURE	DATE
<i>[Signature]</i>	8/24/99
INVENTOR'S FULL SIGNATURE	DATE

**WITNESSES' NAMES AND SIGNATURES:**

THE WITNESSES, IN SIGNING THIS FORM, ATTEST TO THE FACT THAT THEY UNDERSTAND THE INVENTION.

WITNESS'S FIRST/LAST NAME (Type)	PHONE	WITNESS'S FIRST/LAST NAME (Type)	PHONE
David Ireland	317-245-2003	STEVEN GOLDBERG	52847
WITNESS'S FULL SIGNATURE	DATE	WITNESS'S FULL SIGNATURE	DATE
<i>[Signature]</i>	8/24/99	<i>[Signature]</i>	8/24/99

NOTE: BEFORE SUBMITTING, ALL BLANKS MUST BE COMPLETED AND ALL ADDITIONAL SHEETS MUST ME SIGNED, DATED, AND WITNESSED BY ALL INVENTORS AND TWO WITNESSES.

MOTOROLA CONFIDENTIAL AND PRROPRIETARY

MOTOROLA CONFIDENTIAL PROPRIETARY

## Method to Improve Capacity and Battery Life of an Ad Hoc Short Range Systems using Sensor Management

### I. PROBLEM

Short Range systems such as Bluetooth suffer from battery life and capacity limitations due to the ad hoc nature of the system. To centralize the system to improve these conditions would defeat the ad hoc nature and advantages of the short range system. What is needed is a way to utilize other surrounding information to improve battery life and system capacity while keeping the ad hoc nature of the network in place.

### II. THE SOLUTION

Sensors are becoming more miniature and will be ubiquitous on people and inside objects over the coming years. The number and type of sensors available will be huge (sound, video, direction, gyro...etc.). Short range systems such as Bluetooth will also become ubiquitous and available in many devices. The ubiquity of miniaturized sensors in conjunction with short range wireless will open up a plethora of personalized and customized capabilities for the consumer. In addition, these new combinations of sensors, sensor processing, sensor management and short range wireless can be used to improve on the ad hoc nature of the short range system.

Our invention utilizes sensors combined with short range wireless systems to improve two aspects which can be problems with the short range ad hoc network. These are battery life and capacity. However, sensors alone may not completely solve the problem, but sensor processing and management done in the short range unit, or shared amongst short range units can be used to greatly enhance the performance of a short range device. The following details several embodiments of this invention:

1. Embodiment - We claim multiple sensor processing done by a mobile short range unit for the purposes of using said processed information to make decisions to increase the battery life of the said unit.
2. Embodiment - We further claim that said processed sensor information may be shared with other mobile or fixed short range units for the purpose of optimizing the battery life of all units sharing said information.
3. Embodiment - We further claim that said processed sensor information may be shared with other mobile or fixed short range units for the purposes of creating new information to be processed by the other units. This new information, shared amongst the ad hoc system, may be used to improve the system capacity limitations while retaining the ad hoc nature of the short range system.

INVENTOR: *[Signature]* DATE: 8/24/99  
INVENTOR: *[Signature]* DATE: 8/24/99  
MOTOROLA CONFIDENTIAL PROPRIETARY

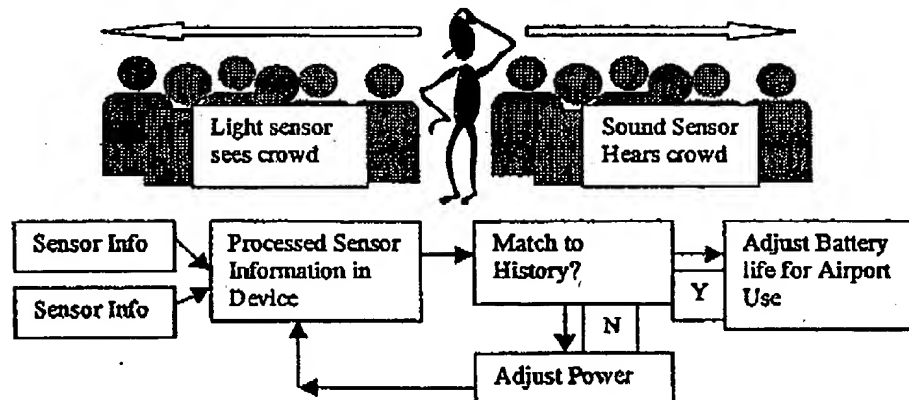
WITNESS: *[Signature]* DATE: 8/24/99  
WITNESS: *[Signature]* DATE: 8/24/99

## MOTOROLA CONFIDENTIAL PROPRIETARY

4. Embodiment – Sensor information processed by short range unit to improve battery life. Short range transceivers can consume more battery life than required while traversing through short range cells and looking for push or pull information or registrations. A motion sensor may be used to alter the power on/off or power level of the short range transceiver registration (including other WAN systems) during motion, and alter again when the unit is still. Other type sensors (light sensors, sound sensors, range sensors) may be used for the unit to process and manage other sensor added information to determine when the short range module should change its power on/off or power level state. (For example: at night or in motion, the module is off; in daylight or not moving it is on). As a reduction to practice, these may be preferred in a section of the bluetooth enabled device under a page for the user called "sensors", which not only add value to the user's life (such as a medical sensor), but improve the operation of the bluetooth enabled device and surrounding short range system.



5. Embodiment – Coupled sensor information to determine environment and improve battery life or capacity. Sensors can be coupled through a device processor to the short range transceiver AND utilize learning functions to determine a pattern match of the usage and respond by immediately improving the battery capability of the user device. An example of this can be for the processor to learn that the user, when coupled with certain sensor inputs, is in a busy area (processed to be an airport) and quickly gives the bluetooth module full power for usage.



6. Embodiment – Coupled sensor information to determine environment and improve network capacity limitation through master cell segmentation. As in embodiment 2, the same sensor processing can be used to determine if the user is in a crowded area (range sensors, sound sensors, etc.). At this point the sensed information is processed to activate the bluetooth module to alert the short range system

INVENTOR: *[Signature]*  
INVENTOR: *[Signature]*

DATE: 8/24/99  
DATE: 8/24/99

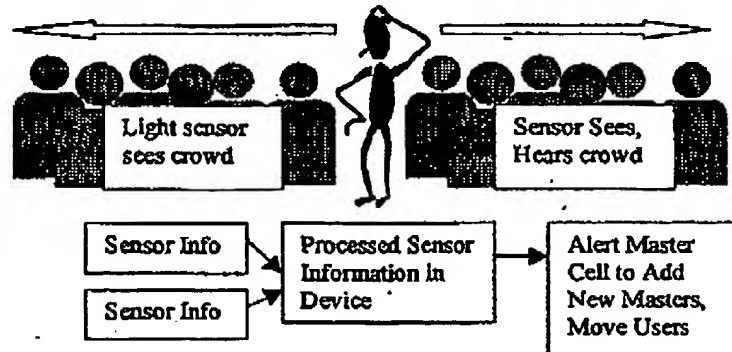
WITNESS: *[Signature]* DATE: 8/24/99  
WITNESS: *[Signature]* DATE: 8/24/99

MOTOROLA CONFIDENTIAL PROPRIETARY

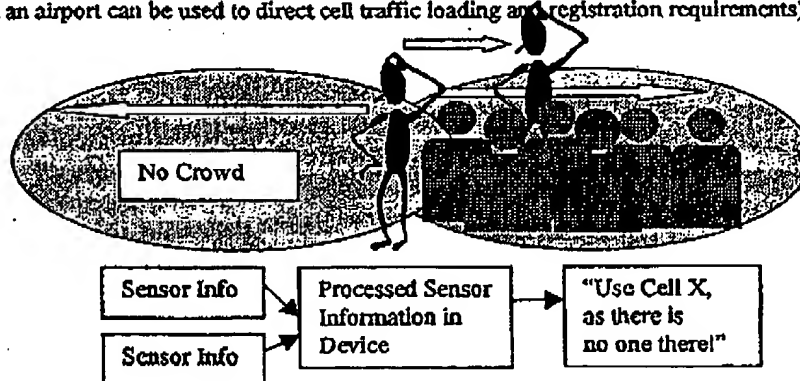
2

## MOTOROLA CONFIDENTIAL PROPRIETARY

master cell to improve the capacity by segmenting some users to other master cells and setting up new master cells for taking on more users. This uses sensor managed information to improve the capacity performance of an, otherwise, ad hoc system.



7. Embodiment – Shared sensor information to improve battery life and capacity of ad hoc short range network. Not only are sensor information managed and processed for use by the short range unit or system, but other units may also utilize sensor processed information from units other than their own. Sensors connected to the unit processor may utilize same unit sensors OR, sensor information may be sent across the short range ad hoc network to other units' sensors for processing by those units. Thus, setting up a 'network' of sensors. The sensed information may remain distributed to other units throughout the system, or may be centralized temporarily by one unit for ad hoc. For example - Sensed information, such as light, range, sound, video, may be used by other units to choose different masters (based on capacity - i.e., an airport lounge is crowded in one direction, but not the other where there is a lightly loaded master cell), or to conserve battery life (motion and direction sensors of many users in an airport can be used to direct cell traffic loading and registration requirements).



8. Embodiment – Service Discovery used to acknowledge and share sensed information. The short range system service discovery protocol can be used to improve the sensor information and processing, which in turn benefits the short range system. Service discovery can be used to add more sensors (for the users' unit or from many users' units) or to look for certain fixed positioned sensors for

INVENTOR: *[Signature]*  
INVENTOR: *[Signature]*

DATE: 8/24/99  
DATE: 8/24/99

WITNESS: *[Signature]*  
WITNESS: *[Signature]*

DATE: 8/24/99  
DATE: 8/24/99

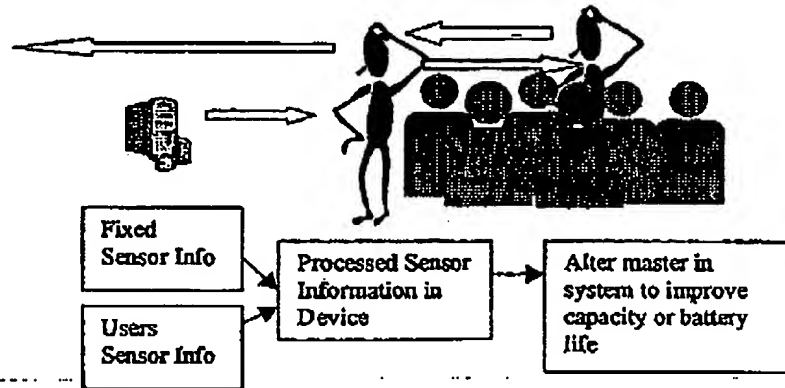
MOTOROLA CONFIDENTIAL PROPRIETARY

3



## MOTOROLA CONFIDENTIAL PROPRIETARY

information. An example of this embodiment is for a short range unit to service discover other fixed equipment with sensors which can supplement ad hoc decision making for battery and capacity (sometimes using the fixed power line units as masters, etc).



9. Embodiment – Sensors can also be used to adjust the power levels of the unit to save battery.
10. Embodiment – Inertial sensors and accelerometer sensors can be used to determine not only direction and angle, but also position of the unit. In some instances, this type of sensing may be useful for determining when to power on the short range unit. For example, when a unit is in a vertical position, such as a pda on the belt, it may be off; when the unit is in a horizontal position.
11. Embodiment – Centralized dynamic traffic control using crowd sensors. In a centralized network, crowd detectors are used (at the device). The sensed data is relayed to a central controller where a population distribution is drawn for the local coverage area. The central controller allocates bandwidth to Picocells according to crowd distribution.
12. Embodiment – Channel changes based on crowd sensors. A crowd/motion detector is used at the subscriber unit to make assumptions on the propagation characteristics. In crowded areas the fading is very likely to be observed because of Multipath. When crowds are moving the channel can be modeled as a fading channel at the speed of the moving crowd. Moreover the presence of crowds indicates that shadowing losses will likely decrease the link margin. Based on crowd detection, the subscriber unit may adjust the power level to account for estimated propagation losses. Alternatively the subscriber unit can halt andALOHA transmission or drop the data rate in order to maximize the chance for a successful transmission.

INVENTOR: *[Signature]*  
INVENTOR: *[Signature]*

DATE: 8/24/99  
DATE: 8/24/99

MOTOROLA CONFIDENTIAL PROPRIETARY

4

WITNESS: *[Signature]*  
WITNESS: *[Signature]*

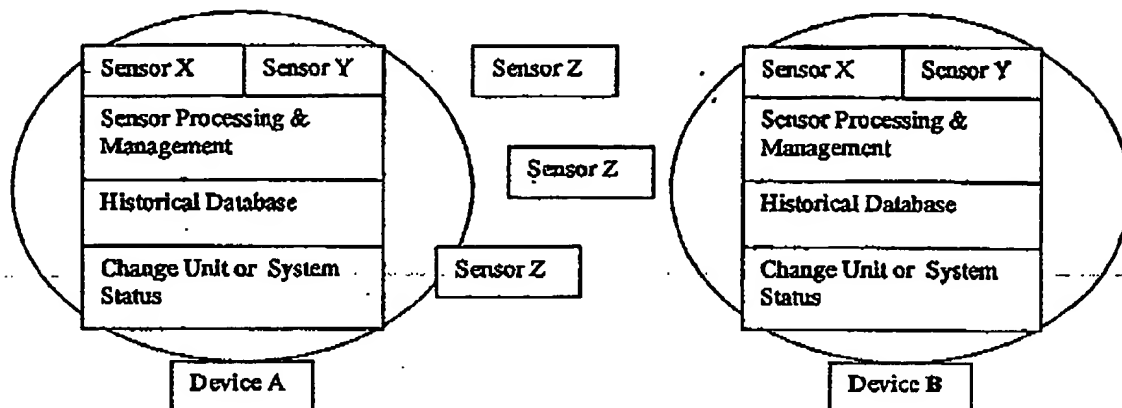
DATE: 8/24/99  
DATE: 8/24/99

8/24/99

## MOTOROLA CONFIDENTIAL PROPRIETARY

## III. CONCLUSION

This invention uses sensors, sensor processing, sensor management (ad hoc and centralized), and sensor sharing to improve the battery life and capacity of a short range system while retaining the ad hoc nature and advantages of the system.

INVENTOR: *[Signature]*

DATE: 8/24/99

INVENTOR: *[Signature]*

DATE: 8/24/99

MOTOROLA CONFIDENTIAL PROPRIETARY

5

WITNESS: *[Signature]*

DATE: 8/24/99

WITNESS: *[Signature]*

DATE: 8/24/99

8/24/99

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

☐ **BLACK BORDERS**

☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**

☐ **FADED TEXT OR DRAWING**

☒ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**

☐ **SKEWED/SLANTED IMAGES**

☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**

☐ **GRAY SCALE DOCUMENTS**

☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**

☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**

☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**